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(57) An in-car (in-vehicle) entertainment system comprises: a wireless device 10,20 able to receive entertainment data from a server 32 connected to the Internet 12 and to transmit data to the Internet; a central processing unit 22; a user interface 38; and electronic storage means 42 for storing a user's personal entertainment preferences; said wireless device being configured to send data to and receive data from said central processing unit which responds to commands from the user interface and the preferences stored in the electronic storage means; said central processing unit being configured to receive data from the Internet via the wireless device and to process said data through a decoder of one or more decoders to produce digital entertainment signals which are then converted into analogue signals by a digital-to-analogue converter 24. The word "entertainment" is interpreted broadly to include serious broadcasts e.g. news, travel bulletins, financial reports.



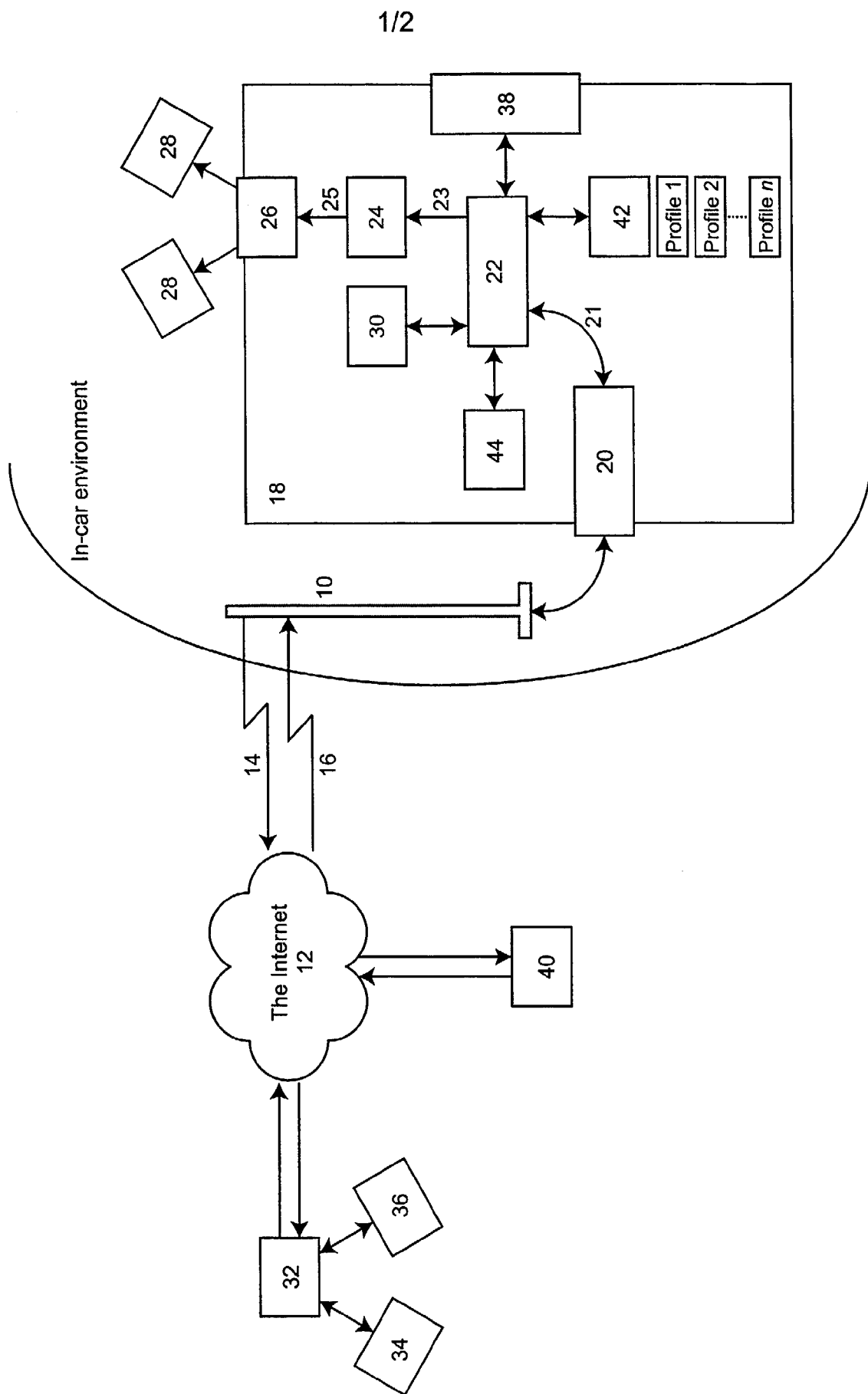
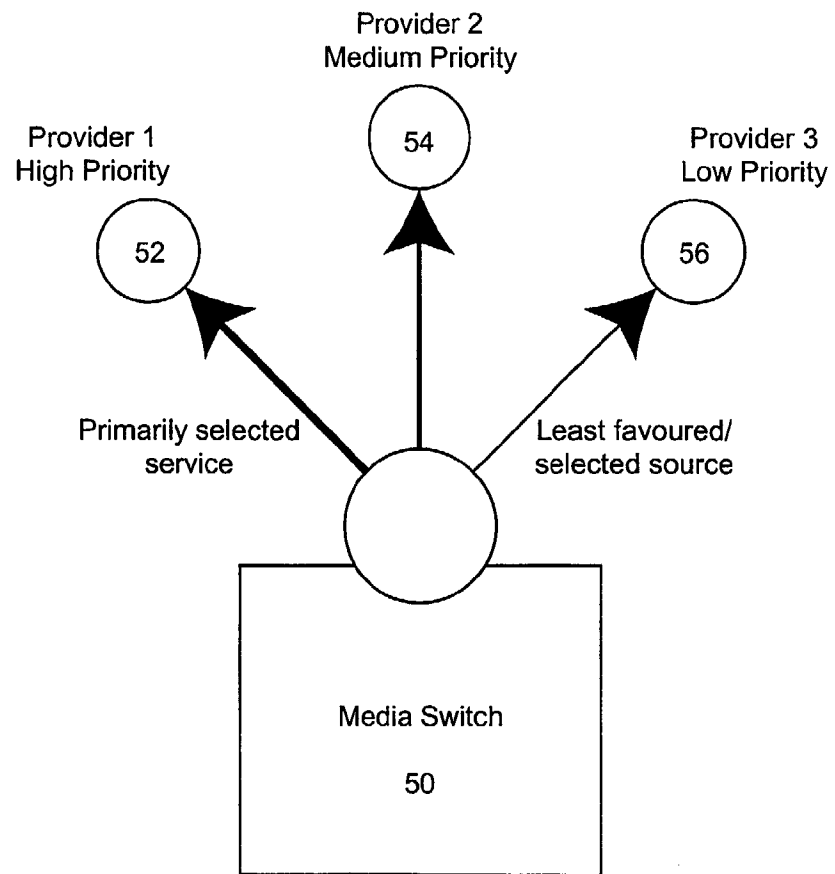


Figure 1

**Figure 2**

AN IN-CAR ENTERTAINMENT SYSTEM

This invention relates to an in-car entertainment system.

It is common for vehicles such as cars, buses and lorries to be provided with an in-car entertainment system. Hereinafter the term 'in-car' is used to mean 'in-vehicle', where
5 the word 'vehicle' is taken to mean any conveyance for transporting people, goods and so on. The word 'entertainment' is also intended to be taken in a broad sense, comprising not only music and speech intended to give pleasure, but also broadcasts for more serious purposes, such as conveying news, financial reports, travel bulletins and so on.

10 In-car entertainment systems usually comprise a radio, often with some means for playing pre-recorded entertainment such as cassettes or compact discs. With such systems, the user's freedom of choice of entertainment is limited and restricted. In the case of pre-recorded entertainment, the user may purchase a recording according to his personal preferences and may then play it in his car. However, the duration of the pre-
15 recorded entertainment on any one recording is limited, typically to just over one hour. The user may take a plurality of recordings with him on his journey, but these take up valuable space in the vehicle. Furthermore, changing the recording in the player may be dangerous, especially if the user is driving the vehicle at speed at the time.

In the case of radio, the user is free to choose from a range of different stations.
20 However, these are limited in number and finding a station to suit the user's preferences may not be possible. A further shortcoming with conventional radio entertainment is that many stations feature regular advertisements, many of which are not of relevance to an

individual user's own consumer preferences. Not only is this a potential annoyance to the user, but is also of little benefit to the advertisers themselves.

It is accordingly an object of the present invention to overcome or significantly mitigate the aforementioned problems.

- 5 According to the present invention there is provided an in-car entertainment system comprising: (a) a wireless device able to receive entertainment data from a server connected to the Internet and to transmit data to the Internet; (b) a central processing unit; (c) a user interface; (d) electronic storage means for storing a user's personal entertainment preferences; (e) one or more decoders capable of converting the
- 10 entertainment data obtained via the Internet and received by the wireless device into digital entertainment signals; and (f) a digital-to-analogue converter capable of converting said digital entertainment signals into analogue signals; said wireless device (a) being configured to send data to and receive data from said central processing unit (b), said central processing unit being configured to respond to commands from the user
- 15 interface (c) and the preferences stored in the electronic storage means (d); said central processing unit being configured to receive data from the Internet via the wireless device (a) and to process said data through a decoder of said one or more decoders (e) to produce the digital entertainment signals; said digital entertainment signals then being converted into analogue signals by the digital-to-analogue converter
- 20 Preferably the transmission and reception of data to and from the Internet is performed under the Wireless Application Protocol.

Preferably the entertainment data are transmitted in MP3 format or as Real Audio (RTM) data streams.

Preferably the system further comprises means for storing entertainment data.

More preferably the system further comprises a microchip or smart card in which is hard-coded a unique identifier, said unique identifier being such that the entertainment data transmitted by the server to the in-car entertainment system is specific to the system
5 having that unique identifier.

Preferably the system is such that the entertainment data may be interrupted by alternative transmissions, said alternative transmissions being dependent on user preferences, time or location.

Preferably the system is such that the entertainment data may include advertisements.

10 More preferably the system is such that the advertisements are selected according to an analysis of the user's entertainment preferences or his Internet browsing behaviour.

Most preferably the analysis of the user's entertainment preferences or his Internet browsing behaviour is performed in real-time.

Preferably the system is equipped to automatically download algorithms for decoding
15 entertainment media content.

Preferably the system is able to receive entertainment data from a plurality of media content providers.

More preferably the system further comprises a media switch to automatically select entertainment data from said plurality of entertainment media content providers.

More preferably the entertainment data played to the user is automatically selected by the media switch on the basis of the user's personal preferences.

More preferably the entertainment data played to the user is automatically selected by the media switch on the basis of the frequency with which that source has previously
5 been manually selected by the user.

According to the present invention there is also provided a method of using the above in-car entertainment system comprising using the user interface to create, view, edit or delete personal entertainment preferences.

Preferably the method of using the system further comprises using a web-TV or a home
10 computer connected to the Internet to interact with the server providing the entertainment data and to play said entertainment data.

Preferably the method of using the system further comprises using a web-TV or a home computer connected to the Internet to create, view, edit or delete personal entertainment preferences for use with the in-car entertainment system.

15 More preferably the method of using the system further comprises enabling the user to have a compact disc made of selected music.

According to the present invention there is also provided a method for providing entertainment in a vehicle using an in-car entertainment system, said system comprising:
(a) a wireless device able to receive entertainment data from a server connected to the
20 Internet and to transmit data to the Internet; (b) a user interface; (c) electronic storage means for storing a user's personal entertainment preferences; (d) a central processing

unit configured to respond to commands from the user interface (b) and the preferences stored in the electronic storage means (c); (e) one or more decoders capable of converting the entertainment data obtained via the Internet and received by the wireless device into digital entertainment signals; and (f) a digital-to-analogue converter capable of converting said digital entertainment signals into analogue signals; said method comprising the steps of: (i) using the wireless device (a) to receive entertainment data from the Internet; (ii) sending said data to the central processing unit (d); (iii) processing said data through a decoder of said one or more decoders (e) to produce the digital entertainment signals; (iv) converting said digital entertainment signals into analogue signals using the digital-to-analogue converter (f); and (v) amplifying said analogue signals to deliver entertainment in the vehicle.

According to a further aspect of the present invention there is provided a vehicle fitted with an in-car entertainment system as described above.

Brief description of the drawings

The present invention will now be described by way of example only with reference to the accompanying drawings in which:-

Figure 1 shows the system architecture of a presently-preferred embodiment of the invention, including the in-car environment and its interaction with the Internet; and

Figure 2 illustrates a media switch used in connection with the presently-preferred embodiment of the invention.

Description of the presently preferred embodiment of the invention

The invention will now be described by way of example only. This example is the best way known to the applicant of putting the invention into practice, using the currently available Internet technology. However, this example is not the only way in which the invention can be put into practice, and new ways will become apparent with advances in Internet technology.

The in-car entertainment system described herein may also include the standard features of conventional in-car entertainment systems, such as a radio, a cassette player or a compact disc player.

As illustrated in Figure 1, the presently-preferred embodiment of the invention is designed to interact with the Internet via the Wireless Application Protocol (WAP). The Wireless Application Protocol enables the in-car entertainment system to send and receive data to and from the Internet. The system uses an antenna connected to a WAP-enabled transmitter and receiver unit. Both the antenna and the transmitter/receiver unit are known in the art, for example, by those skilled in the design and construction of mobile telephones. The transmitter/receiver unit is configured to send and receive Internet data to and from a central processing unit.

Whilst it is intended for the in-car entertainment system to be integral with the WAP-enabled transmitter/receiver unit, this transmitter/receiver unit and the antenna may optionally be provided by a separate WAP-enabled mobile telephone.

The central processing unit 22 is configured to handle entertainment data received from the Internet. The entertainment data are, for example, in the form of MP3 files or Real

Audio (RTM) streams. The central processing unit is equipped to decode the entertainment data received from the Internet to give digital audio data 23, which can then be passed through a digital-to-analogue converter 24 to give an analogue signal 25. This analogue signal is then fed into an amplifier 26 connected to speakers 28, which
5 play the entertainment for the user to listen to.

The entertainment data fall broadly into two media types, both of which can be cached on a local storage device 30 such as a hard disk or a flash memory chip within the system. The first media type, analogous to conventional radio, is streamed via the Internet for the user to listen to straight away. Data in the Real Audio (RTM) format are
10 well suited to this purpose.

The second kind of entertainment, analogous to conventional recordings such as cassettes or compact discs, is downloaded from the Internet (preferably as MP3 files) and stored, again using a local storage device 30 such as a hard disk or a flash memory chip. A writeable (or re-writable) CD or DVD could be employed as alternatives to a hard
15 disk or flash memory chip. The storage device can store data either in digital audio format or in raw MP3 format. Entertainment data from this storage device may be recalled and listened to as desired.

The entertainment data are provided by a media provider via a server 32 connected to the Internet 12. This server provides gateways to both MP3 content providers 34 and
20 Internet radio providers 36. The websites providing MP3 content may be run by recording artists themselves, or by music publishers. The server also provides gateways to other mobile service providers, such as those providing mapping and navigational systems.

The in-car system 18 allows the user to input entertainment preferences via a user interface 38. The design and configuration of user interfaces is well known amongst those skilled in the art – for example, electrical and electronic engineers – and comprises a display along with controls for, for example, browsing through entertainment categories, previewing or listening to the next or the previous MP3 file in a series, exploring different Real Audio (RTM) channels, and selecting in accordance with personal preferences. The user interface is controlled by the central processing unit 22, and also includes means for supplying personal information – for example, the user's name. These means may include buttons, a touch-screen, a joystick-type controller or even speech recognition. In a particularly preferred embodiment of the invention the user also has the option of selecting whether or not he wishes his selected entertainment to be interrupted by alternative transmissions such as news bulletins or travel news updates. A single user's personal preferences are known as a preference profile, and these can also be created (and subsequently viewed, edited or deleted) using web-TV or a home computer 40 connected to the Internet. The user can also use his home computer 40 to listen to the entertainment selections, and can choose to have a compact disc made of his favourite music. This disc can be written locally by the user's own CD-writer, or remotely by the media provider and then sent by post to the user.

The central processing unit 22 stores the user's preference profile into a database 42 of n distinct profiles. The other preference profiles could be those of other users of the same system, or could relate to the same user but correspond to different types of entertainment. For example, one user could set up two preference profiles – one for his journey into work in the morning, comprising Internet radio news and current affairs programming (streamed via Real Audio (RTM)), and the other being for his journey

home in the evening and comprising pre-recorded music from a favourite artist (downloaded in MP3 format). The display on the user interface 38 confirms the user's preferences and provides information on the entertainment selected.

The server 32 is configured to recognise each specific in-car entertainment system by way of a unique identifier which is hard-coded into a smart card or microchip 44
5 connected to the system's central processing unit 22. The server recognises the identifier stored on the smart card or microchip and responds to the preference profile selected on the user interface. Advantageously, the use of a smart card enables one user to take his preference profile from the car to use in another suitably-equipped
10 system – for example, a web-TV at home, or in another in-car entertainment system.

The user's personal preference profile enables the entertainment media provider to tailor the transmitted data to suit the individual. This content personalisation may take a number of forms:

For pre-recorded entertainment, the MP3 files are downloaded according to the user's
15 preferences. Likewise, for Internet radio, the channel (or programme) is selected according to his entertainment preferences.

If the user has requested that travel bulletins be included, then these are streamed from the most appropriate local Internet radio channel. By detecting the position of the mobile telephone (using known technology such as GPS positioning) these bulletins can be
20 engineered such that they are relevant to the user's current position and locality.

Advertisements may be included in the entertainment data supplied by the server. In the case of musical entertainment, these advertisements will typically be added to the data

stream between pieces of music. The advertisements provided are selected by the server on the basis of an analysis of the user's entertainment preferences or his Internet browsing behaviour. This analysis can be performed in real-time, thereby enabling the advertisements to be of particular interest to the user. In this way the user is not
5 subjected to irrelevant and potentially annoying advertisements, but instead the advertisers are able to target the broadcasting of their advertisements towards those most likely to be interested. Relevant advertising content will also be displayed on the media provider's website when the user visits it using his home computer 40.

Provision for multiple entertainment media providers

10 The in-car entertainment system is able to receive entertainment data from a plurality of media content providers or transmission servers. Each provider can be manually selected through a set of options presented through the system's user interface 38 or displayed on the user's home computer 40. Alternatively the provider can be automatically selected by a media switch, as described later in detail. The content
15 providers, the entertainment media offered, and the advertisements may be targeted towards the user on the basis of his entertainment preferences or Internet browsing (or on-line purchasing) habits.

Each entertainment media provider sends uniform information packets with header information which describes and identifies their service, with the information required to
20 decode their Internet transmissions.

For example, a music content provider named "Diamond-Disks" which specialises in supplying downloadable music from the 1960s (in MP3 format) would send the following packet, in Extensible Markup Language (XML) format:

```

<header : music channel = "Diamond-Disks">
    <type : music type format = "mp3">
    </type>
    <body : music>
5         [All your favourite hits from the Sixties!]
    </body>
</header>

```

Similarly, an Internet radio news information provider named "International-Finance-24" which specialises in business and financial news from around the world (streamed as

10 Real Audio (RTM) format) would send:

```

<header : news channel = "International-Finance-24">
    <type : newstype format = "ra">
    </type>
    <item : finance age="3600">
15    <body : news>
        [International business and finance news, 24 hours a day]
    </body>
    </item>
</header>

```

20 In the above example the 'age' instruction is used to indicate the age of the media content.

The transmissions can be in any supported format. The system's central processing unit

22 is configured to decode MP3 or Real Audio (RTM) data in the hardware. Custom file

formats may be introduced by specific media providers running, for example, subscription channels. The machine code for decoding these custom file formats is downloaded into the in-car entertainment system once the channel has been subscribed to, and is stored for future use. This allows the system to continuously update itself, enabling the latest music formats to be played without the need to purchase new hardware or a replacement system. Subscription to subscription channels can be performed either through the system's user interface 38, using web-TV or a home computer 40, or via a WAP enabled mobile telephone.

The method of transmission of the packets provides a unified method of transmission of information via an Internet streaming service using the standard Transmission Control Protocol / Internet Protocol (TCP/IP). The information can vary greatly in content but its type is always specified through a single packet specification. Furthermore, the information can be transmitted using the Extensible Markup Language (XML) format, which is a unified, well-understood data transportation method and enables web servers to utilise the technology with little or no modification.

In order to decode and select suitable channels and contents, the central processing unit employs a media switch 50 (Figure 2) which is able to automatically select transmission servers. Content may be written to a cache in the background, but the switch will filter unselected channels from broadcast.

This method of transmission allows dynamic subscription checking. If a service has been subscribed to, the media switch can watch for information from the media provider. If the media provider proves some data, the media switch will automatically switch the current service to the provider so that this alternative service can be listened to.

An example of the use of the system is as follows:

The user subscribes to a real time travel information service. He enters details of a forthcoming journey to be undertaken by car, describing the route. He is also a subscriber of an Internet radio channel playing contemporary pop music.

- 5 When the journey is in progress, the media switch is configured, by default, to process the data stream supplied by the pop music channel, and the user listens to the pop music as he drives. The media switch continually watches for packets from the travel information service provider. Typically the packets will be empty (null) and no switching will take place. This effectively means that the traveller will continue to listen to his
- 10 music of choice.

- However, if and when new travel information is made available which pertains to the traveller's journey, the travel information service provider will send out packets indicating that new information has been received. These packets will be detected by the media switch, which then automatically switches to the travel information channel whilst
- 15 caching the remainder of the previous transmission.

- The media switch is able to make intelligent, autonomous decisions about which channels to switch to depending on various factors, such as a rated priority weighting decided by the user during the subscription process, or how frequently the channel is manually selected by the user. The primarily selected source 52 is assigned a high
- 20 priority, whereas a less favoured source 54 is assigned a medium priority, and the least favoured source 56 is assigned a low priority. Each time a given channel is manually selected its relative priority weighting is increased, and consequently the more likely is

the media switch to automatically switch to these services as new information is made available.

In summary, the in-car entertainment system offers, *inter alia*, the following beneficial features:

- 5 • Real-time download of playback-decoding algorithms, allowing self-upgrade to new media formats.
- Provision of a hardware media switch which can make intelligent decisions on content as it is made available, and can watch for new information to become available.
- 10 • A unified description of media content which allows all media providers to send a single type of packet, with entertainment (e.g. music) data dependent on the service provided, without having to worry about whether or not the system supports the media format.
- Ability to play media dynamically as it is published from a multiplicity of sources.
- 15 • Ability to unify multiple services through a single, personalised unit.

CLAIMS

1. An in-car entertainment system comprising:

(a) a wireless device able to receive entertainment data from a server connected to the Internet and to transmit data to the Internet;

5 (b) a central processing unit;

(c) a user interface;

(d) electronic storage means for storing a user's personal entertainment preferences;

10 (e) one or more decoders capable of converting the entertainment data obtained via the Internet and received by the wireless device into digital entertainment signals; and

(f) a digital-to-analogue converter capable of converting said digital entertainment signals to analogue signals;

15 said wireless device (a) being configured to send data to and receive data from said central processing unit (b), said central processing unit being configured to respond to commands from the user interface (c) and the preferences stored in the electronic storage means (d); said central processing unit being configured to receive data from the Internet via the wireless device (a) and to process said data through a decoder of said one or more decoders (e) to produce the digital

entertainment signals; said digital entertainment signals then being converted into analogue signals by the digital-to-analogue converter (f).

2. An in-car entertainment system as claimed in Claim 1 wherein the transmission and reception of data to and from the Internet is performed under the Wireless Application Protocol.

3. An in-car entertainment system as claimed in either preceding Claim wherein the entertainment data are transmitted in MP3 format.

4. An in-car entertainment system as claimed in either Claim 1 or Claim 2 wherein the entertainment data are transmitted as Real Audio (RTM) data streams.

5. An in-car entertainment system as claimed in any preceding Claim wherein the system further comprises means for storing entertainment data.

6. An in-car entertainment system as claimed in any preceding Claim, said system further comprising a microchip or smart card in which is hard-coded a unique identifier, said unique identifier being such that the entertainment data transmitted by the server to the in-car entertainment system is specific to the system having that unique identifier.

7. An in-car entertainment system as claimed in any preceding Claim wherein the entertainment data may be interrupted by alternative transmissions, said alternative transmissions being dependent on user preferences, time or location.

8. An in-car entertainment system as claimed in any preceding Claim wherein the entertainment data may include advertisements.

9. An in-car entertainment system as claimed in Claim 8 wherein said advertisements are selected according to an analysis of the user's entertainment preferences or his Internet browsing behaviour.
10. An in-car entertainment system as claimed in Claim 9 wherein said analysis of
5 the user's entertainment preferences or his Internet browsing behaviour is performed in real-time.
11. An in-car entertainment system as claimed in any preceding Claim wherein the system is equipped to automatically download algorithms for decoding entertainment media content.
- 10 12. An in-car entertainment system as claimed in any preceding Claim wherein the system is able to receive entertainment data from a plurality of media content providers.
13. An in-car entertainment system as claimed in Claim 12 wherein the system further comprises a media switch to automatically select entertainment data from
15 said plurality of entertainment media content providers.
14. An in-car entertainment system as claimed in Claim 13 wherein the entertainment data played to the user is automatically selected by the media switch on the basis of the user's personal preferences.
15. An in-car entertainment system as claimed in Claim 13 wherein the entertainment
20 data played to the user is automatically selected by the media switch on the basis

of the frequency with which that source has previously been manually selected by the user.

16. A method of using an in-car entertainment system as claimed in any preceding Claim, comprising using the user interface to create, view, edit or delete personal entertainment preferences.

17. A method of using an in-car entertainment system as claimed in any of Claims 1 to 15, comprising using a web-TV or a home computer connected to the Internet to interact with the server providing the entertainment data and to play said entertainment data.

18. A method of using an in-car entertainment system as claimed in Claim 17, comprising using a web-TV or a home computer connected to the Internet to create, view, edit or delete personal entertainment preferences for use with the in-car entertainment system.

19. A method of using an in-car entertainment system as claimed in Claim 17 comprising enabling the user to have a compact disc made of selected music.

20. A method for providing entertainment in a vehicle using an in-car entertainment system, said system comprising:

(a) a wireless device able to receive entertainment data from a server connected to the Internet and to transmit data to the Internet;

(b) a user interface;

(c) electronic storage means for storing a user's personal entertainment preferences;

(d) a central processing unit configured to respond to commands from the user interface (b) and the preferences stored in the electronic storage means (c);

5 (e) one or more decoders capable of converting the entertainment data obtained via the Internet and received by the wireless device into digital entertainment signals; and

(f) a digital-to-analogue converter capable of converting said digital entertainment signals into analogue signals;

10 said method comprising the steps of:

(i) using the wireless device (a) to receive entertainment data from the Internet;

(ii) sending said data to the central processing unit (d);

15 (iii) processing said data through a decoder of said one or more decoders (e) to produce the digital entertainment signals;

(iv) converting said digital entertainment signals into analogue signals using the digital-to-analogue converter (f); and

(v) amplifying said analogue signals to deliver entertainment in the vehicle.

21. An in-car entertainment system substantially as hereinbefore described with reference to the accompanying drawings.
22. A method of using an in-car entertainment system substantially as hereinbefore
5 described with reference to the accompanying drawings.
23. A method for providing entertainment using a system substantially as hereinbefore described with reference to the accompanying drawings.
24. A vehicle fitted with an in-car entertainment system as claimed in any of Claims 1 to 15 and 21.



INVESTOR IN PEOPLE

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Claims searched: 1-24

Examiner: Mike Davis
Date of search: 26 October 2000

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): G4H (HNMC)

Int Cl (Ed.7):

Other: Online: WPI, EPODOC, JAPIO, INSPEC

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2324395 A (NEWS DATACOM) eg abstract and pages 21-23	1,20 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.